SATURN

MPR-SAT-63-12

MPR-SAT-63-12
September 20, 1963

MARSHALL SPACE FLIGHT CENTER

HUNTSVILLE, ALABAMA

GPO PRICE $ _____

OTS PRICE(S) $ _____

Hard copy (HC) $1.00

Microfiche (MF) .50

SATURN MONTHLY PROGRESS REPORT
August 15 - September 18, 1963)

by

SATURN SYSTEMS OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA

GEORGE C. MARSHALL SPACE FLIGHT CENTER

MPR-SAT-63-12

SATURN MONTHLY PROGRESS REPORT

(August 15 - September 18, 1963)

ABSTRACT

The Saturn Monthly Progress Report describes progress from August 15 through September 18, 1963, in the Saturn I, IB, and V vehicle R&D programs. The asterisk (*) that appears throughout this report denotes continuation of an item cited in the last Monthly Report.

This report does not include status of Saturn engine programs. These data will be provided separately in the Monthly Progress Report, F-1, H-1, J-2 and RL-10 Engines, prepared by the Marshall Space Flight Center, Engine Management Office.

Saturn I Configuration: On August 21, S-I-5, S-IU-5 and payload arrived at AMR. S-IV-5 was flown to AMR, arriving there on September 21. On August 21, at MSFC, dynamic testing was begun of SA-D6. At SACTO, a successful propellant loading test was conducted with the S-IV All Systems vehicle.

Saturn IB Configuration: The S-IVB/IB contract modification has been signed by DAC; the contract was forwarded to NASA Headquarters for approval. S-IVB Battleship tank hydrostatic tests and tank calibration have been completed at SACTO.

Saturn V Configuration: MSFC has completed the S-IC test fuel tank lower cylindrical skin section and all meridian welds on the lower bulkhead. On August 27, the first S-II meridian weld was completed at Seal Beach. Late delivery of the tank, and facility activation delay have caused a probable two months slip of the first S-II Battleship hot firing. A contract was awarded IBM for design and development of a Saturn V guidance computer.

GEORGE C. MARSHALL SPACE FLIGHT CENTER

MPR-SAT-63-12

SATURN MONTHLY PROGRESS REPORT

(August 15 - September 18, 1963)

by

SATURN SYSTEMS OFFICE

TABLE OF CONTENTS

GEORGE C. MARSHALL SPACE FLIGHT CENTER

MPR-SAT-63-12

SATURN MONTHLY PROGRESS REPORT

(August 15 - September 18, 1963)

SECTION I. SUMMARY

*On August 21, the S-I-5, S-IU-5, and payload arrived at AMR. Following erection of the booster, S-IV spacer, and instrument unit at LC-37B, pre-launch checks and tests began and are continuing satisfactorily. (Page 2, Sect. II, Para. A.1.a.)

*Checkout of the S-IV-5 was completed August 26; the stage, removed from the stand September 14, was transported to AMR, via Guppy, arriving September 21. (Page 2, Sect. II, Para. A.1.b.)

*Pre-static checkout of the S-I-7 stage at MSFC was completed on August 22, and the stage erected in the static test stand on September 6. The first, short-duration static firing is scheduled on October 1. (Page 4, Sect. II, Para. A.3.a.)

*Dynamic testing of the SA-D6 began at MSFC on August 21. (Page 5, Sect. II, Para. B.1.)

*At SACTO, a successful propellant loading test was conducted August 21 with the S-IV All-Systems vehicle. (Page 5, Sect. II, Para. B.3.)

All automatic checkout equipment for the first Michoud S-I checkout complex was delivered and accepted in mid-August. (Page 6, Sect. II, Para. C.5.)

*In September, DAC signed the S-IVB/IB contract modification and the contract submitted to NASA Headquarters for approval. (Page 7, Sect. III, Para. C.1.)

The asterisk (*), used throughout this report, denotes continuation of an item cited in the last Monthly Report.

*By mid-August, S-IVB Battleship tank hydrostatic tests and tank calibration were completed at SACTO. (Page 7, Sect. III, Para. C.2.b.)

*During this report period, MSFC completed the S-IC test fuel tank lower cylindrical skin section and all meridian welds on the lower bulkhead. (Page 9, Sect. IV, Para. A.2.a.)

*On August 27, the first S-II meridian weld was completed on the aft common bulkhead welder at Seal Beach. (Page 10, Sect. IV, Para. B.2.a.)

*Late delivery of the S-II Battleship tank, and consequent facility activation delay, have caused a probable two months slip of the scheduled June 1964 Battleship hot firing date. (Page 10, Sect. IV, Para. B.2.f.)

In August, a contract was awarded IBM to design and develop a guidance computer for the Saturn V Vehicle. Contract negotiations are continuing for development and production of flight computers. (Page 13, Sect. IV, Para. C.1.)

*On September 9, steel erection began at the MSFC Saturn V Dynamic Test facility; construction is on schedule. (Page 13, Sect. V, Para. A.1.)

At MTO, a contract was awarded for the Bascule Bridge; construction was begun of the Laboratory and Engineering Building; S-IC and S-II static test stand excavation and pile driving was begun. (Page 14, Sect. V, Para B.)

SECTION II. SATURN I CONFIGURATION

A. FLIGHT VEHICLE STATUS

1. SA-5 Vehicle

*a. On August 21, the S-I-5 stage, S-IU-5, and payload for the SA-5 flight vehicle arrived at AMR aboard the barge Promise. The S-I-5 was delivered to LC-37B on August 23; erection was completed on August 26. Booster fins and the S-IV spacer were installed. Following modifications at the Industrial Area, the Instrument Unit was transferred to the launch complex and installed on September 5. Overall vehicle pre-launch checks and tests are being performed on schedule, with no major problems encountered.

*b. The second acceptance test of the S-IV-5 stage was successfully accomplished at SACTO, August 12, for a duration of 477 seconds. Cut-off was at LOX depletion, as planned. Preliminary review of test data indicated that all systems performed satisfactorily and all test objectives were achieved. Post-firing inspection revealed that the

condition of the stand and support equipment was satisfactory. Post-static stage checkout began August 26. The stage was removed from the stand on September 14. Following preparation for shipment, the stage was loaded on the Guppy and flown to AMR, arriving September 21.

c. On August 16, a meeting was held at MSFC to discuss test programs for S-IU-5 (vibration testing) and S-IU-6 (S-IU-5 modified to S-IU-6 design for vibration and structural testing). Vibration test results have indicated that the Instrument Unit 70-inch center tube requires additional longitudinal, lateral, and torsional supports to shift existing resonant frequencies. Existing resonant frequencies coincide with resonant frequencies of the ST-90 and ST-124 stabilized platforms. Documentation of these modifications has been released and the necessary installations made on the S-IU-5. However, MSFC has initiated a further vibration test program to evaluate these design changes. The additional testing is scheduled for completion by September 18. Based on test results, MSFC will decide whether to retain, reduce, or alter the stiffening supports presently incorporated in the S-IU-5.

2. SA-6 Vehicle

*a. Final checkout of the S-I-6 stage continued satisfactorily during the report period. The S-I-6 schedule has been revised for compatibility with the S-IV-6 schedule. The revision establishes completion of post-static checkout on October 31, and completion of preparation for shipment on November 21. After a month's storage at MSFC, the stage will be shipped to AMR late in December.

*b. Retrofit and modification of the S-IV-6 continued at Santa Monica throughout the report period. Transfer from Santa Monica to the test site was delayed by the decision to accomplish certain modifications at the Santa Monica Plant, rather than at SACTO. Completion of the work is estimated by mid-September, with shipment to SACTO anticipated on September 27. Flight qualification testing is expected to begin during October.

*c. Checkout of the S-IU-6 is proceeding satisfactorily at MSFC. Pressure and functional tests, alignment, electrical continuity and status checks have been completed. Electrical checkout has been delayed as a result of modifications to checkout equipment; however, no schedule impact is anticipated. All installed systems will be ready for simulated vehicle tests with the S-IV interface and the S-I system; these will begin during the next report period.

d. Structural testing of the S-IU-6 has been delayed from early September, pending completion of S-IU-5 vibration testing. (Refer to paragraph II.A.1.c.) No schedule impact is anticipated. Rescheduling of the tests is now under review.

*3. SA-7 Vehicle

a. On August 22, pre-static checkout of the S-I-7 stage was completed at MSFC. The stage was erected in the static test stand on September 6. Propellant loading operations are scheduled to begin September 24, with the first, short-duration, flight qualification test to be performed on October 1.

b. The S-IV-7 stage is in the Santa Monica assembly area. Installation work remains behind schedule, due to parts shortages and required modifications.

c. Assembly of S-IU-7 began at MSFC on August 12 and is continuing satisfactorily. A revised schedule has been established, based on the estimated availability of the S-IV-7. The schedule designates completion of assembly on November 4 and completion of checkout on January 3, 1964.

4. SA-9 Vehicle

*a. In mid-August, inboard engine installation for S-I-9 was completed. One outboard engine, accidentally damaged on August 14, was replaced by a spare; outboard engine installation was completed on August 28. Late deliveries of several S-I-9 components may delay start of pre-static checkout; impact of late deliveries is being evaluated.

*b. At Santa Monica, the S-IV-9 stage has been moved to the assembly area and preparations are underway for start of final installation. The S-IV-9 schedule remains dependent on the S-IV-7 schedule.

c. Fabrication of the S-IU-9 structure is scheduled to begin at MSFC on September 23. Delivery of the ST-124 has been delayed until the end of September; however, no schedule impact will result.

d. Fabrication of the S-IU-9 structural test unit is scheduled for completion on September 30. Structural testing will be conducted during October.

e. MSFC has begun design work for a purge and cooling system to be installed in the Instrument Unit of SA-9 and subsequent vehicles. Gaseous nitrogen will be used to cool certain individual electronic components and to purge the S-IV stage forward area.

*5. SA-8 Vehicle. Installation of S-I-8 inboard engines began at Michoud late in August. By mid-September, outboard engine modification was near completion. Assembly and installations in tail areas continued as scheduled. Completion of stage assembly is expected September 30, on schedule.

*6. SA-10 Vehicle. Early in September, at Michoud, S-I-10 fuel tanks were clustered. All engines have been received and are undergoing modification. Stage assembly is expected to be complete December 8, on schedule.

*7. SA-111 Vehicle. Fabrication of S-I-111 second stage adapter and tail section assemblies continues on schedule at Michoud. Two 70-inch fuel tanks and the 105-inch LOX tank were received by mid-September. Tank clustering is expected to begin October 29, on schedule.

B. TEST VEHICLE STATUS

*1. SA-D6 Vehicle. Dynamic test series No. 4 began at MSFC August 21, with the SA-D6 vehicle (using boilerplate Apollo Command and Service modules). Testing is proceeding as planned and is scheduled for completion on October 1, 1963.

*2. SA-ST Structural Test Vehicle. Ground testing of the Saturn I structural system at MSFC was completed, on schedule, at the end of August. The program has been augmented by addition of several secondary tests, including aerodynamic heating and tail section pressurization. Test preparations began late in August; testing is to begin October 1 and will continue throughout the month.

*3. S-IV All-Systems Vehicle. At SACTO, on August 21, a successful propellant loading test was conducted with the S-IV All-Systems vehicle. Test objectives included functional check of the common bulkhead system, propellant transfer system, LH_2 tanking system, and fuel tank insulation. Post-test inspection revealed no structural stage damage. Build-up of the vehicle to support hot firings has begun and is expected to be complete by mid-November.

*4. Stratification Test Program. The S-IV Dynamics/Facilities vehicle has been installed at the MSFC test area and build-up of facility support equipment is continuing on schedule. Stratification testing is to begin October 24, and be completed early in November 1963.

C. GROUND SUPPORT EQUIPMENT

1. Delivery of Saturn I GSE to LC-37B and the AMR staging building is complete, with the exception of additional GSE items added by scope change.

2. Deliveries to SACTO of additional S-IV GSE, required by scope change, have been rescheduled from July to September in order to assure meeting AMR GSE requirements. The SACTO GSE will be used at Stand 2B and the control center; the delay is not anticipated to have schedule impact.

3. During the report period, MSFC successfully installed and checked out a complete access platform in the forward interstage of the inert S-IV stage (in the MSFC Dynamic Test Stand). The access platform has been shipped to AMR for installation on the flight stage.

4. Electrical system schematics for S-IU-6 electrical support equipment system were released during the report period. The Instrument Unit ESE is being modified and updated to the S-IU-6 configuration; completion is scheduled by mid-September.

5. All Packard-Bell automatic checkout equipment for the first S-I checkout complex at Michoud was delivered and accepted in mid-August. The equipment is scheduled to become operational October 6, with S-I-8 checkout to begin in mid-October.

6. Acceptance testing of swing arms Nos. 2 and 3 was successfully completed at MSFC, September 5. The swing arms will be used on the LC-34 umbilical tower for SA-7. Swing arm No. 3 has been shipped to the launch complex. However, swing arm No. 2 will be retained at MSFC until late in September in order to test an additional S-IV stage ground quick-release housing.

7. At MSFC, acceptance testing of swing arm No. 4 (for LC-37B, SA-6) began in mid-September; testing will be completed during the next report period.

D. TRANSPORTATION

1. Representatives of MSFC, DAC, and Aero Spacelines met at Santa Monica in mid-August to review instrumentation data collected during Guppy flights. Result of data analysis indicates that loads transmitted to the S-IV stage during Guppy flight are well within stage design limits.

2. Studies performed by Aero Spacelines during August demonstrate that the Guppy can use the Santa Monica Airport. Flights from this airport would eliminate one-half day of road travel between the DAC Santa Monica Plant and the Los Angeles International Airport.

3. On September 11, the Guppy was damaged by a taxiing aircraft, while at the Los Angeles International Airport. The damage was repaired and the Guppy was operational by September 13.

SECTION III. SATURN IB CONFIGURATION

A. VEHICLE GENERAL

1. The second Saturn IB Quarterly Design Review was held at MSFC on September 17, 1963.

2. Preliminary Emergency Detection System specification for Saturn IB (and V), based on failure mode analysis, has been developed by a joint MSFC-MSC Ad Hoc group and reviewed, on September 12, by the Crew Safety Panel. The specification will next be released for design.

B. S-IB STAGE.

Chrysler PERT reporting for S-IB-1 began August 30; reporting of S-IB-3 is scheduled to begin September 27.

C. S-IVB STAGE

*1. Contract Status. DAC has signed the S-IVB/IB contract modification. On September 10, the contract was submitted to NASA Headquarters for approval.

2. Stage Status.

a. The S-IVB Quarterly Review was held at MSFC on September 12. DAC indicated that the Battleship and Structural Test stage activities are generally on schedule. MSFC is further evaluating the schedule effects of possible deviations from certain previous plans, i.e., component qualification tests, end item delivery schedules, and test plans.

*b. Battleship Stage. By mid-August, S-IVB Battleship hydrostatic tests and tank calibration were completed at SACTO. Mass spectrometer leak tests are also complete. The tank was placed in a horizontal position and is being readied for the installation of internal insulation. The Battleship stage is scheduled for installation into the test stand by mid-November 1963.

*c. Hydrostatic Test Stage.

By the end of August, four LH_2 cylinder segments had been welded together at Huntington Beach. The panjiris welder was certified on scrapped skins and produced satisfactory production welds. No further problems are anticipated in this area.

On August 31, the tee-ring was welded to the forward dome of the common bulkhead. No distortion of the ring or "canning" of the dome was encountered. X-rays of the weld showed only minor porosity in the areas where the tee-ring-to-dome weld crosses meridian welds; however, in cleaning up these areas, a crack was discovered and required additional welding.

The aft dome for the common bulkhead is complete. The layup jig, which uses vacuum to hold the aft dome, is complete except for minor leakage problems, presently being corrected. On September 19, layup and bonding began of the honeycomb; the first bonding cycle should be complete September 21.

The aft LOX dome has been completed and all welds checked.

*d. Dynamics Test Stage.

Three LH_2 cylinder skins have been finish machined and are at Long Beach for forming. Two additional skins are in process: one has been rough machined; the other is being machined. However, machine adjustments are required prior to finish machining of these skins.

Tee-rings for attaching the common dome have been welded, machined, and are complete. Segments for the forward common dome are complete; this will be the next dome to enter the meridian welder. The segments for the aft common dome are welded together and the dome is ready for welding to the tee-ring. Segments for the aft LOX dome have been formed; four of these are ready for welding, and the remaining segments are being trimmed and etched.

e. Structural Test Stage. Initial design of the S-IVB structural test stage was completed by DAC in August.

*f. During the report period, MSFC, DAC, TAPCO, and Marquardt personnel met to re-evaluate the 150-pound thrust engine development program. Because of development problems encountered by the subcontractor, it was determined that TAPCO would develop engines to meet the attitude control requirements for Saturn IB and V vehicles, and that TAPCO would continue to develop another engine of 150-pound thrust to meet the ullage requirements for Saturn V. The engines will be developed in three blocks: Block I for Saturn IB/S-IVB; Block II for Saturn V/S-IVB attitude control and steady state motor; Block III for Saturn V/S-IVB venting and chilldown ullage requirements. Further, recommendations were made that Marquardt demonstrate the feasibility of the cold-wall engine design as a backup to the ullage requirement. It was also requested that DAC be authorized to initiate a backup program for Saturn V/S-IVB ullage motor requirements.

D. INSTRUMENT UNIT. MSFC has completed and distributed the preliminary cable interconnection diagram for S-IU-201.

E. GROUND SUPPORT EQUIPMENT. During the report period, NASA Headquarters approved a contract with RCA for six ground computer systems, four for Saturn IB and two for Saturn V. Delivery of the first computer is scheduled in May 1964; delivery of the final computer in August 1964.

SECTION IV. SATURN V

A. S-IC STAGE

*1. Contract Status. MSFC and the Boeing Company have agreed to Modification I, and the contract package is being prepared for delivery to NASA Headquarters. The modification calls for change to Plan V and other miscellaneous requirements.

2. Stage Status

*a. On August 22, corrosion preventive treatment was completed of the S-IC test fuel tank upper Y-ring and skin cylinder areas. Also completed during this report period were the lower cylindrical skin section and all meridian welds on the lower bulkhead. Completion of anti-slosh ring baffle installation, scheduled for September 16, was delayed by lack of tube supports and splice plates in transit from Boeing Seattle. Assembly of the lower bulkhead was delayed during the report period by distortion problems encountered with the gore segments after welding outlet fittings. Deviations were found in radial hole locations, particularly in the gore with four fittings. Age-forming to correct the weld-induced distortion proved only partially successful. Incremental forming is being used to alleviate the problem by selective over-forming gore contour after chemical milling and prior to fitting. However, further lower bulkhead fabrication is delayed until chemical milling has been accomplished of a special overformed polar cap to compensate for weld shrinkage. The Y-ring to bulkhead weld is the next scheduled operation.

*b. During this report period, all gore segments were received at MSFC for the S-IC-T fuel tank bulkheads. No problems were encountered as the S-IC-T gores are not chem milled. Five suction fittings have been received and the remainder are in process at Boeing. Center engine support components for the S-IC-T are behind schedule due to manufacturing problems; however, the delay has not affected the program. During this report period, delivery of the seamless LOX tunnels for the S-IC-T fuel tank was rescheduled to mid-January 1964. Late delivery of a mandrel (used in fabrication of the seamless tunnels) is contributing greatly to the delay. In view of the contractor's inability to produce and deliver tunnels as scheduled, a backup tunnel featuring weldments is being developed by Boeing. Also, problems have been encountered in procurement of propellant and helium ducting. Support of both Boeing and MSFC by the propellant ducting contractor is doubtful; backup sources are being determined for propellant and helium ducting.

*c. At MSFC, the structural portion of the S-IC forward area mockup was completed during this report period. The intertank mockup assembly fixture has been received and is being installed. All

skin panels and the structural ring for the mockup have been fabricated.

d. On August 28, fire damage to an S-IC gore assembly fixture was too severe for repair at Michoud, and the fixture was shipped to Wichita on September 3 for repair. The fixture was returned to Michoud on September 16. No impact is expected on the working schedule. The tool will be used initially in assembling the upper fuel tank bulkhead for the structural test stage.

e. S-IC fin-shroud interference heating test was begun in mid-September in JPL's hypersonic tunnel. Temperature sensitive paint models will be tested for about two days; heating and pressure models are to be tested during the period September 20 through October 3. S-IC base heating tests are being conducted at the Lewis Research Laboratory. The first tests, in the 10 X 10 supersonic tunnel, are being conducted between Mach 2.0 and 3.5.

f. Seven tests were conducted during this report period of the model S-IC cluster sound suppression device. Investigation was to determine the optimum inlet conditions on the deflector. Inlet modification did not appreciably increase the effectiveness of the device. Further studies are being planned.

B. S-II STAGE

1. Contract Status

a. Firm proposals for changes to the present S-II contract (including the Plan V schedule slippages) have been submitted but not yet negotiated.

b. Change orders issued in August included: re-design forward skirt structure for internal pressure; increase LH_2 tank insulation thickness; study optimized mixture ratio control program; change structural static test tower from CFE to GFE; modify bulkhead tooling for seal strip design; flight control switch change; EBW firing unit design; checkout GSE changes; provide NPSH testing; and flight EBW detonator testing.

2. Stage Status

*a. On August 27, the first S-II meridian weld was completed on the aft common bulkhead welder at Seal Beach. X-ray inspection showed the weld to be acceptable. During the weld operation, a 3/4 inch hole was burned in the weld area when the sensing unit malfunctioned. The sensing unit has been repaired and a second set of gores is being prepared for weld.

*b. During this report period, 9 production waffle sections and 7 thin segments for the common bulkhead were accepted by NASA Inspection. Comparison of total quantity accepted with Plan V schedule requirements shows a 3 months' slip in schedule at the end of this report period.

*c. At Downey, S-II electro-mechanical mockup component installation is continuing by using some substitute parts, as contracted flight-type components are not available. During this report period, a J-2 engine hard mockup was installed on the thrust structure, in addition to the two soft model J-2 engines previously positioned. Other installations completed included eight dummy ullage rockets and the systems tunnel connecting the aft and forward structural stages. Installation of the forward-section black-box mockups is continuing on schedule.

*d. At Downey, the aft section of the S-II mockup for delivery to MSFC has been accepted by NASA Inspection and will be delivered prior to the scheduled date of October 15. The forward area mockup is complete except for the helium system and insulation of the liquid hydrogen bulkhead; the section will be delivered on schedule.

*e. At Inglewood, L.A. Division, an additional 54-inch diameter bulkhead will be built for use in the aluminum mandrel test program. The bulkhead will differ from other test samples as the final meridian weld will be made after working the materials to remove irregularities. Any final weld distortion will be worked out on the aluminum mandrel fixture. This method will be considered when determining Seal Beach processing techniques.

*f. Delivery of the S-II Battleship tank thrust structure to Santa Susana is scheduled for October 18, about 2 months later than planned. Design refinements, plus manufacturing difficulties, caused the delay. Consequently, facility activation, scheduled for October 24, has been delayed until January 1, 1964, probably resulting in delay of the first Battleship hot firing two months later than the scheduled date of June 8, 1964. To preclude further delay in the event of late completion of stage and GSE electrical system design, S&ID has proposed substituting other than flight-type hardware, where necessary, on the Battleship vehicle. Although this may insure an earlier first firing, the proposal does not appear adequate to MSFC, since it will require additional engineering effort and will permit the use of equipment not meeting the flight hardware quality control specifications. MSFC has informed S&ID that substitutions would be considered on individual basis, with safety the prime consideration.

*g. S&ID has determined that the forward common thin gores for the seal-strip backup method must be formed explosively, as the backup stretch forming press will not pull the thicker material required for

the seal-strip designed gore. S&ID has recommended that the El Toro forming die for the forward common thin gore be replaced with one designed to take the higher explosive shock required to form the thicker part.

h. S-II gore stretch forming by the subcontractor was delayed by lack of a plaster splash from S&ID. The splash, for the forward common thin gore segment, was scheduled for delivery on August 26; die completion operations were to begin immediately. The splash will be delivered by September 16, 1963.

i. During this report period, Beech Aircraft began cryogenic insulation tests of an S-II quarter scale model tank. Following the initial test, numerous insulation material cracks were found. The tests may be resumed after evaluation and repair is completed.

j. To avoid difficulties experienced with the S-IV stage, S&ID has established propellant fill procedures to avert severe pressure stress on the S-II bulkhead during loading.

k. A letter contract with DAC for the propellant utilization and loading system has been approved by NASA Headquarters. DAC has begun design.

l. In August, an S-II dual plane separation test program was completed at Langley Research Center; a preliminary report is in preparation. Additional tests may be required to verify extrapolations of the present data.

m. NAA/S&ID PERT reporting has begun with eleven networks reflecting about 8500 activities.

n. At MSFC, S-II blast hazards investigation is continuing. During this report period, two additional spill tests with LOX and RP-1 were conducted. One test was a spill without ignition source; no reaction occurred. During the second test, a delay time of 0.5 seconds after spill was used. The resulting blast was roughly equivalent to those spills with a delay of 1.7 seconds. Results of these tests will be used in assessing the hazards resulting from gross failure of liquid-propelled launch and space vehicles.

o. Results of S-II LOX recirculation studies, completed this report period, show that insulation of the center LOX line is not required. However, to obtain LOX quality at the pump inlet and gas generator for engine ignition, insulation or vacuum jacketing on the outboard lines is required. With the natural convection system, calculations indicate the LOX tank standpipe is required to obtain adequate LOX flow. Helium bubbling in the LOX return line to accelerate the LOX

flow and eliminate standpipes is also being investigated. All calculations made were based on analytically determined pressure drops and heat leaks into the engine system. Test data to verify these parameters for the J-2 engine has been requested from Rocketdyne.

p. During this report period, it was determined the J-2 engine harness should be an unpressurized, medium duty harness. The harness will utilize a soft rubber sleeve which is protected by braid. The harness would be compatible with the S-II/S-IVB stage structures to avoid both interference and/or weight penalties imposed on the stage due to harness installation design.

C. INSTRUMENT UNIT

1. In early August, a contract was awarded IBM to design and develop a guidance computer for the Saturn V vehicle. The computer will make guidance and steering calculations and perform orbital checkout of the Instrument Unit and S-IVB stage of the Saturn IB and V. The contract, to be completed in early 1964, covers the basic design and a breadboard computer for use in developing the flight computer system. Contract negotiations will continue for development and production of flight computers.

2. During this report period, MSFC released Saturn V Instrument Unit structural drawings; structural test components drawings were completed and hardware orders placed. A test panel of the present configuration was received at MSFC and testing has begun.

D. GROUND SUPPORT EQUIPMENT

1. The Saturn V Automation Plan is in process at MSFC and is expected to be released on October 1.

2. During August, S&ID awarded a subcontract to American Machine and Foundry for design and manufacture of five S-II stage transporters. MSFC has disapproved a 1.5 safety factor for these transporters and has recommended a safety factor of 3.0.

SECTION V. FACILITIES

A. MARSHALL SPACE FLIGHT CENTER

*1. On September 9, steel erection began at the Saturn V Dynamic Test facility. Tunnel excavation is complete and the main tunnel floor poured. Facility construction is on schedule.

*2. Steel erection at the S-IC Static Test Stand is continuing on schedule. Utilities installation is proceeding inside and outside the concrete towers, the deflector support framework is being fabricated, and technical systems installation is continuing on schedule.

*3. F-1 Engine Test Stand construction continues on schedule. Concrete has been placed for the preparation building foundation and footings.

*4. Steel erection of the F-1 Turbopump Test Tower has begun. The first tier of columns have been placed and connecting steel for the first and second levels is being installed.

5. The brick and mortar phase has been completed of the S-IVB auxiliary propulsion system test facility. Systems buildup is on schedule. Tests of the 50-pound thrust engine, two of which have been received from TAPCO, are scheduled to begin early in October

B. MISSISSIPPI TEST OPERATIONS

*1. On August 15, a contract was awarded for construction of the Bascule Bridge. The estimated completion date is January 1965.

2. Construction has begun of the Laboratory and Engineering Building, scheduled for completion in November 1964.

3. Excavation and pile driving for both the S-IC and S-II static test stands has been initiated, with completion of the work scheduled for March 1964.

4. On September 9, a contract was awarded Farrell Construction Company, Memphis, Tennessee, for construction of the MTO cryogenic docks, canal extension, and deluge pump intake structure. The central heating plant contract was awarded to General Pipe, Incorporated, Farmington, Michigan, on September 16.

5. Advance notice of construction packages has been issued to prospective bidders for the navigation lock and lock water supply, central control building and data handling center, and the data acquisition facility. Bids are scheduled for issue during the next report period.

6. The Sverdrup & Parcel and Associates, Incorporated, contract has been extended from its expiration date of August 22, 1963, to January 31, 1964.

C. MICHOUD

1. In early August, a contract was awarded for construction of the Michoud engineering building. Completion is scheduled for August 1964.

2. At Michoud, all structural steel for the VAB has been erected and installation of roof decking will begin when weather permits. Construction has been delayed five days due to Hurricane Cindy; however, the JOD of November 1, and completion date of December 17, are not affected. Platforms have been completed for installation of mechanical equipment. Drawings prepared by MSFC for use at the Marshall VAB will be used by Boeing to install equipment at Michoud.

D. CONTRACTOR FACILITIES

1. The DAC S-IV vertical checkout facility at Santa Monica is expected to be available on October 11, 1963.

*2. At SACTO, construction of Complex Beta is proceeding on schedule. Steel work on the calibration building, including tower, has been completed. Installation of the main water line and cryogenic tank construction is in process.

3. DAC has released plans and specifications for the Gamma Complex at SACTO. Bid opening was scheduled early in September.

4. Completion of the S-II bulkhead fabrication building, service building, and water conditioning building at Seal Beach, California, is expected by the end of September 1963.

5. At Seal Beach, joint occupancy of the Vertical Assembly Building will be later than November 22, 1963. The first Navy PERT run indicates a JOD in late February. Schedule data is being refined and a final schedule target date will be reached in September.

6. At the end of this report period, construction progress of some S-II Santa Susana facilities was as follows: control center modifications 99 percent complete; test stand stage and service towers 55 percent; area storage and transfer systems 50 percent; Coco 1 and 4 flame deflectors and dollies 70 percent; Coco LH_2 storage sphere 88 percent; Coco GH_2 high pressure cylinders 80 percent; Coco LOX bulk storage 91 percent; Coco GH_2 recovery 94 percent; Coco 1 Battleship tank, LOX sump, thrust structure and forward skirt 90 percent; LH_2 supply vessel 41 percent; Bulkhead test facility 86 percent.

MPR-SAT-63-12
September 20, 1963

APPROVAL

SATURN MONTHLY PROGRESS REPORT

(August 15 - September 18, 1963)

by SATURN SYSTEMS OFFICE

The information in this report has been reviewed for security classification. Review of any information concerning Department of Defense or Atomic Energy Commission programs has been made by the MSFC Security Classification Officer. The highest classification has been determined to be UNCLASSIFIED.

for OSWALD H. LANGE
Director, Saturn Systems Office

MONTHLY DISTRIBUTION LIST

INTERNAL DISTRIBUTION

M-DIR
M-DEP-R&D
-R&D, Mr. Neubert
-ADM

M-AERO-DIR
-TS (Circulate)
-A (2)
-D (2)
-E (2)
-F (2)
-G
-P (2)
-PCA (2)
-PS, Mr. Jean
Mr. McNair

M-ASTR-DIR
-E, 4487 (2)
-E, HIC (2)
-F
-G
-I
-M
-N
-P
-PC
-R
-TSJ (2)

M-COMP-DIR
-R, Mr. Moore (2)

M-CP-DIR (2)
-D, Mr. Kline
Mr. Daniels
-E
-M
-P, Mr. Foster (2)
Capt. Bollinger

M-FE-CH
-P, Mr. Fleming

M-FPO

M-HME, Dr. Rudolph

M-SAO-DIR
-A, Mr. Jones
-C, Mr. Nelson

M-LVO-DIR

M-ME-DIR
-TS (3)

M-MICH (6)

M-MS-H (5)
-IP, Mr. Remer
-IPL (13)

M-MTO-MGR, Capt. Fortune

M-P&VE-DIR
-ADM-P, Mr. Hofeus
-E, Mr. Schulze
-F, Mr. Goerner
-M, Dr. Lucas
-N, Col. Fellows
-O, Mr. Belew
-P, Mr. Paul
-REL, Mr. Burrows
-S, Mr. Kroll
-TSN, Mr. Finzel
-V, Mr. Palaoro (11)
-VK, Mr. Barraza

M-QUAL-DIR
-E
-M
-P
-Q
-S (4)
-S, E. Brooks

M-REL, Mr. Schulze (3)
Mr. Noor, HIC
-E, Mr. Luce

M-RP-DIR
-R, Mr. Miles

M-SAT (40)

M-SS-F (3)

M-TEST-DIR
-ADM
-D
-FPO
-PC
-T

EXTERNAL DISTRIBUTION

NASA Headquarters
Federal Office Bldg. Number 6
Washington 25, D.C.
Attn: Dr. Seamans, AA
Dr. Mueller, M
Capt. Freitag, ML
Mr. Rafel, MLV (10)

NASA
Manned Spacecraft Center
Houston, Texas
Attn: Mr. Gilruth, Director
Mr. Piland, Apollo Proj. Ofc.
Mr. Decker
Mr. Johnson
Mr. Tribble
Mr. Woosley

Douglas Aircraft Company, Inc.
3000 Ocean Park Blvd.
Santa Monica, California
Attn: Mr. Gordon Stoops, A-2-260

NASA/MSFC
Space & Information Systems Div.
12214 Lakewood Blvd.
Downey, California
Attn: Mr. Don Bowden

Major Frank Borman
P. O. Box 1537
Houston, Texas

Western Operations Office
150 Pico Blvd.
Santa Monica, California

NASA
Langley Research Center
Hampton, Virginia
Attn: Librarian

O. S. Tyson, MSFC Rep. (2)
Sacramento, California
c/o Douglas Aircraft Company
White Rock Road
Rancho Cordova, California

M-SSVH, Attn: Col. Newman (2)
Air Force Liaison Officer
Bldg. 5250, Room M132

General Electric Company - A.S.D.
Box 594
Huntsville, Alabama
Attn: Dr. Schultz (4)
Mr. Ladwig
Mr. Meyers

NASA
Lockheed Missile and Space Co.
Bldg. 537, Facility 5
Sunnyvale, California

Lockheed Missile and Space Co. (2)
P. O. Box 504, Bldg 537
Sunnyvale, California

NASA
Launch Operations Center
Cocoa Beach, Florida
Attn: LOP-DIR
-C, Attn: Mr. Body
-D, Attn: Mr. Poppel
-H
-HN (2)
-JI
-JR
-JRT

Redstone Scientific Info. Center (2)
U. S. Army Missile Command
Redstone Arsenal, Alabama
Attn: Chief, Document Section